

Health Consultation

Current Air Emissions Exposure of On-Base Personnel

KELLY AIR FORCE BASE

SAN ANTONIO, BEXAR COUNTY, TEXAS

EPA FACILITY ID: TX2571724333

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U.S. DEPARTMENT OF HEALTH AND HUMAN SERVICES
Public Health Service
Agency for Toxic Substances and Disease Registry
Division of Health Assessment and Consultation
Atlanta, Georgia 30333

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Prepared by:

Exposure Investigation and Consultation Branch
Division of Health Assessment and Consultation
Agency for Toxic Substances and Disease Registry

Introduction

ATSDR completed Phase I of the Kelly Air Force Base (AFB) public health assessment (PHA) in August 1999. ATSDR recommended further investigation of potential exposures to environmental air contamination from Kelly AFB be performed during Phase II.

This health consultation is a part of Phase II. It reports the results of the evaluation of the potential exposure of on-base personnel to current air emissions from stationary sources at Kelly AFB. These on-base personnel are not covered by the regulations of the Occupational Safety and Health Association (OSHA). ATSDR concludes that potential exposures of on-base personnel to current air emissions from stationary sources are not likely to result in adverse health effects. This conclusion is based on air dispersion modeling of data from the 1996 Kelly AFB air emissions inventory.

Background

The late Congressman Frank Tejeda petitioned ATSDR to investigate environmental contaminant releases from Kelly AFB and the adverse health effects reported by community residents in neighborhoods north and southeast of the base. ATSDR publicly released findings during Phase I of the public health assessment on August 24 1999, and also described activities to be performed during Phase II. During Phase I, ATSDR performed an air dispersion screening model of air emissions from stationary sources to estimate possible air contaminant concentrations in the community. Results of the air dispersion model indicated the highest estimated contaminant concentrations may be present on base. These emissions may result in exposure to on-base personnel. These personnel may not be protected by OSHA regulations for the specific emission since their occupational environment is outside the occupational environment generating the specific emission. These potential exposures are considered environmental exposures and not occupational exposures.

The results of the screening model and risk analysis performed during the Phase I evaluation indicated that the estimated increase in the risk for developing cancer may have been highest in some areas on base. ATSDR concluded from the Phase I evaluation that health effects would be unlikely due to current air exposures. ATSDR recommended that a refined air dispersion model be performed during Phase II to reduce uncertainty in the initial air dispersion modeling. Current exposures are defined by ATSDR for purposes of this document as those occurring from 1996 to base closure, which is scheduled to occur during 2001.

Discussion

ATSDR questioned whether on-base personnel were being exposed to contaminants in ambient air that were emitted by on-base processes (stationary sources) at Kelly AFB. OSHA regulates the workplace environment and protects workers from exposure to chemicals to which there is foreseeable exposure. Usually workers are protected from chemicals that they work with and

chemicals that are generated during the industrial process. For example, a worker may be required by OSHA to wear a respirator for protection from solvent fumes. Another worker from a different occupation which does not involve solvents may not be required to wear a respirator. If solvent fumes are emitted from one work environment and enter another work environment, these workers may not be protected from this secondary exposure. It is this secondary exposure that ATSDR addresses in this consultation.

ATSDR performed an air dispersion model of stationary sources to estimate the concentration of contaminants in the ambient air on base. ATSDR used the Environmental Protection Agency's Industrial Source Complex Short Term - 3 (ISCST-3) to model the air dispersion of the 1996 air emissions inventory from Kelly AFB. ATSDR estimated what happened to air emissions from industrial processes on base when they were released into ambient air. A computer model estimated the effect meteorological parameters such as air speed, wind direction, and temperature may have had on the contaminant. The computer model estimated the concentration of the contaminant as it spread out from its source of emission.

In performing this evaluation, ATSDR used an approach which considers all of the health and environmental evidence to evaluate potential health effects [2]. The estimated contaminant concentrations were compared to exposure levels that would not be expected to result in adverse health effects (i.e., comparison values). Those contaminants exceeding their screening values are further evaluated. Acute (short term) and chronic (long term) exposures are further evaluated by comparing levels of exposure to levels associated with noncancer health effects reported in the scientific literature. Chronic exposures are also evaluated for potential cancer health effects by performing a risk assessment using site specific exposure scenarios rather than the general assumptions used to develop screening values.

Short term exposures

Short term (acute) exposures to estimated levels of contaminants in ambient air, other than formaldehyde, are unlikely to result in adverse health effects. Laboratory and occupational human exposure studies have been conducted with both normal and asthmatic individuals to determine potential effects from formaldehyde exposure [3-6]. The maximum 1-hour formaldehyde concentration over a 5-year period is estimated to be $1223 \mu\text{g}/\text{m}^3$, which is near the lowest levels that have been associated with acute eye, nose, or upper respiratory irritation [7]. Most individuals cannot tolerate above $6000 \mu\text{g}/\text{m}^3$ and symptoms may become severe above $12,000 - 24,000 \mu\text{g}/\text{m}^3$ [8]. Based on the results of air modeling and estimated exposure, it may be possible for individuals who are sensitive to formaldehyde and are within 300 meters downwind of the jet engine testing facility (see Figure 2) during the 1-hour maximum concentration emission to experience mild to moderate eye irritation. It is estimated that these conditions could occur on the average of once per week.

Long term exposures

Potential long term (chronic) exposures for *noncancer* health effects would be unlikely because all estimated contaminant levels are below screening values for long term noncancer health effects.

ATSDR also evaluated potential long term exposures for *cancer* health effects. The results of screening and subsequent risk assessment are presented in Table 1. The contaminants listed (hexavalent chromium, hydrazine, arsenic, formaldehyde, 1,3-butadiene, benzene, acetaldehyde, tetrachloroethylene or PCE, and cadmium) are those that exceeded the screening values. A risk assessment was then performed to estimate the increase in the risk for developing cancer from chronic exposure to the contaminant. Results of the risk assessment indicates that there is *no apparent increase* (see Table 2) in risk for developing cancer from the estimated exposure level.

ATSDR evaluated whether health effects might be likely from simultaneous exposure to a number of chemicals. ATSDR calculated an estimated risk from potential exposure to each of the chemicals (see Table 1) and added the risk to all of the chemicals at points over the base. This information shows the estimated level of risk for developing any type of cancer from exposure to all of the chemicals (cumulative risk), and the location of the estimated cumulative risk (see Figure 1). The maximum cumulative risk estimated from exposure anywhere on base is 8/100,000 (or 1 case of any cancer for every 12,500 workers exposed). Based on this level of exposure, there would be *no apparent increase in risk* (see Table 2). ATSDR concludes that an increase in the number of individuals developing cancer from current on-base exposures to air emissions from Kelly AFB would not be observed in the population of on-base personnel.

The individual contaminant contributing the greatest amount of risk was hexavalent chromium with an estimated increase in risk of 6/100,000. It is unlikely that adverse health effects would be observed in this population from this level of exposure. The level of hydrazine is over reported, but included because the actual level of relevant emission was not available. While the Air Force uses diesel fuel instead of hydrazine in planes constructed in recent years, the exact number of each type plane on base at any time can vary. ATSDR assumed a worst-case scenario and included all hydrazine as ground level fugitive emissions. The estimated risk at this level is 2/100,000, and it is unlikely that adverse health effects would be observed in this population. The other contaminants (arsenic, formaldehyde, 1,3-butadiene, benzene, acetaldehyde, PCE, and cadmium) did not contribute significantly to the overall increase in risk.

The locations of the maximum concentrations of the individual contaminants of greatest concern are depicted in Figure 2. The associated increases in risk are reported in Table 1. Air dispersion of each contaminant was simulated at 5100 points in and around Kelly AFB with the points 300 meters apart, covering an area of approximately 117 square miles. The points identified in Figure 2 represent emissions that were located within a 300 meter radius of the point. Contaminant emissions of concern are primarily located in two areas where painting, plating, and degreasing or jet engine repair is performed.

Exposure conditions used in the risk assessment were an individual with a 70 kilogram (kg) body weight, exposed for a frequency of 8 hours/day, 5 days/week, 50 weeks/year for a duration of 7 years. Seven years was used for current exposures because of the projected base closing in 2001 (1996-2002 inclusive).

Many Air Force industrial operations have already been reduced or eliminated at Kelly AFB and ATSDR believes that using the 1996 emissions inventory is an appropriate conservative worst-case scenario for current emissions. Past emissions (prior to 1996) are currently being investigated and will be reported when complete. ATSDR cannot predict future emissions from potential future tenants. These future emissions can be addressed with the Texas Natural Resource and Conservation Committee (TNRCC).

Conclusions

Environmental exposures to estimated current air emissions from stationary sources at Kelly AFB would not be expected to result in adverse health effects to on-base personnel.

References

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Table 1.
Contaminants Exceeding Screening Values

Contaminant	Maximum Annual Average Concentration ^a	Screening Value ^b	Estimated Risk ^c
Hexavalent Chromium	0.034	0.00008	6/100,000
Hydrazine	0.159 ^d	0.00039 ^e	2/100,000
Arsenic	0.024	0.0002	2/1,000,000
Formaldehyde	7.	0.08	2/1,000,000
1,3-Butadiene	0.84	0.004	5/1,000,000
Benzene	0.91	0.1	2/10,000,000
Acetaldehyde	2.2	0.5	1/10,000,000
PCE	8.36	3.3 ^e	1/10,000,000
Cadmium	0.0024	0.0006	9/100,000,000

Table 1 is a comparison of the maximum concentrations of estimated air emissions with chronic screening values which are considered by ATSDR to be levels at which adverse health effects would not be expected. Maximum concentrations which exceeded screening values are further evaluated by risk assessment to estimate the relative degree of hazard.

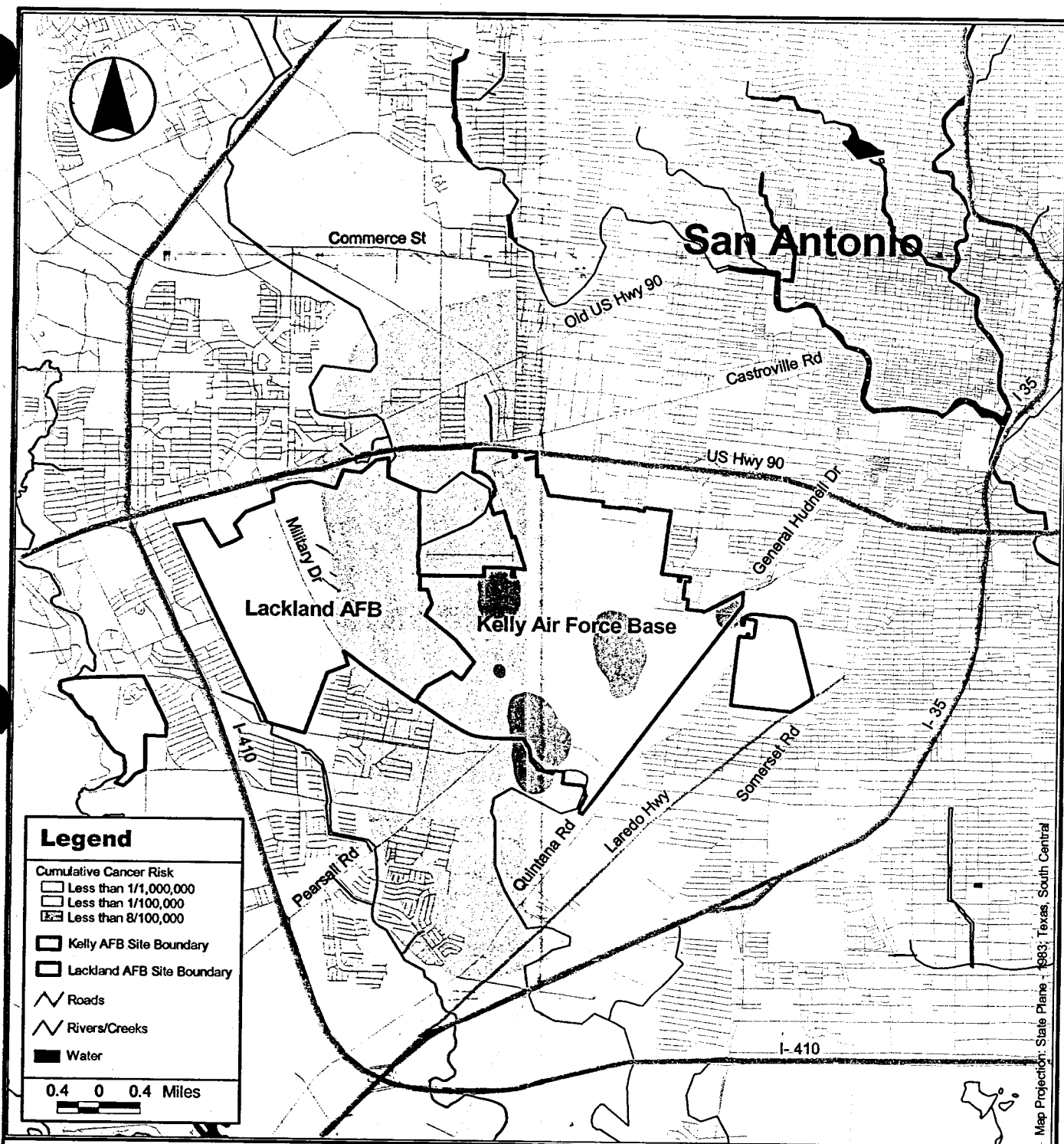
- a All units are in $\mu\text{g}/\text{m}^3$ (micrograms per cubic meter). Average annual concentration is the maximum concentration estimated at any location on base. Concentrations from 1996 air emissions inventory modeled with EPA's Industrial Source Concentration Short Term 3 (ISCST3) air dispersion model.
- b Screening Values are ATSDR's Cancer Risk Evaluation Guide (except where indicated) which assumes a daily exposure for a lifetime (70 years).
- c Estimated risk calculated using Environmental Protection Agency (EPA) Region 6 Inhalation Slope Factors, assuming a body weight of 70 kilograms (kg), for an exposure of 8 hours/day, 5 days/week, 50 weeks/year for 7 years.
- d Hydrazine concentration is over-reported, see text.
- e EPA Region 6 Human Health Medium-Specific Screening Level for ambient air were used where an ATSDR screening value was not available.

**Table 2.
Category Definitions**

Category	Fraction	Decimal	Exponential
No Increased Risk	<1/100,000	<0.00001	<1E-05
No Apparent Increased Risk	1/100,000	0.00001	1E-05
Low Increased Risk	1/10,000	0.0001	1E-04
Moderate Increased Risk	1/1,000	0.001	1E-03
High Increased Risk	1/100	0.01	1E-02
Very High Increased Risk	>1/100	>0.01	>1E-02

Table 2. Category definitions used by ATSDR are intended to define categories of estimated risk to convey the degree of hazard from the defined exposure relative to other exposures. Categories are derived from ATSDR Decision Statement TOX.14. Draft QAA-27. Revised October 21, 1991.

FIGURE 1

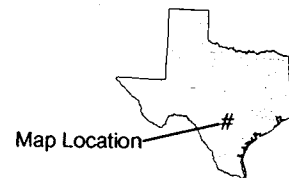


Estimated Cumulative Cancer Risk from Current Air Dispersion Modeling

Kelly Air Force Base

San Antonio, Texas

CERCLIS No. TX2571724333

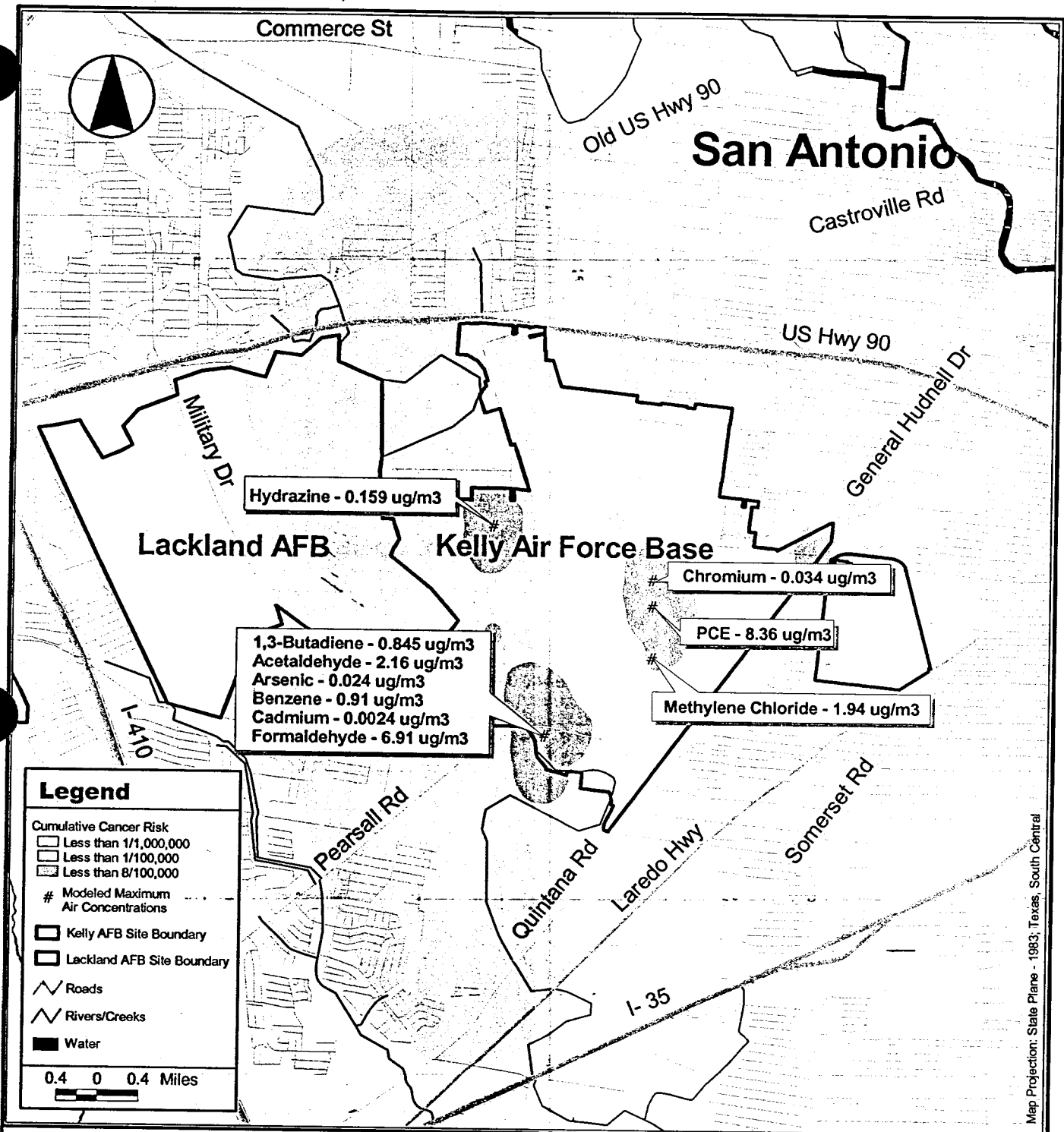


Bexar County, Texas

Base Map Source: 1995 TIGER/Line Files, Site Boundary Source: Kelly AFB, 1996 Emissions Location and Amount Source: Kelly AFB, Health Risk Source: ATSDR (DHAC). Emissions were modeled with EPA's ISCST3 air model and inhalation slope factors from U.S. EPA Region 6 were applied to output to arrive at health risk.

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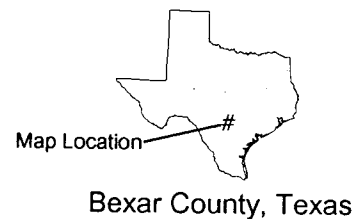
FIGURE 2



Current Air Dispersion Modeling - Estimated Cumulative Cancer Risk and Maximum Air Concentrations

Kelly Air Force Base

CERCLIS No. TX2571724333



Base Map Source: 1995 TIGER/Line Files, Site Boundary Source: Kelly AFB, 1996 Emissions Location and Amount Source: Kelly AFB, Health Risk Source: ATSDR (DHAC). Emissions were modeled with EPA's ISCST3 air model and inhalation slope factors from U.S. EPA Region 6 were applied to output to arrive at health risk.

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